Minutes

Meeting name	**Subject**	**Attendees**
OU-7 Stats Technical Call	OU-7 Background Statistical Methods	ARC Team (John Batchelder, Don Bransford, Randy Miller, John Roseberry, John Sciacca); APTIM Team (JC Isham, Jonathan Shireman)
Meeting date	**Time**	
9/27/17	1300 Pacific	
Location	**Project name**	
Conference Call	Anaconda Copper Mine Site	
AECOM project number	**Prepared by**	
60527278	Don Bransford and John Roseberry	

Ref	Action
01	**Purpose**

Discuss the APTIM Tech Memos on OU-7 Background Statistics developed by J Shireman, including: a) statistical similarity between different sample subsets (e.g., north/south background and shallow/deep soils); b) treatment of outliers; and c) selection of appropriate statistical methods for BCL calculations.

D Bransford: For this call, would like to focus on methods for outlier tests, comparison of north to south background datasets, and selection of the background statistic, based on the discussions presented in the APTIM Tech Memos.

J Shireman: Reviewed the Phase 1 DSR and 2009 BSR, looking at methods used to calculate BCLs. Thinks the 2009 BSR used appropriate methods, but the Phase 1 DSR did not follow the same process of comparing sample subset distributions to select appropriate methods. Specifically, the non-parametric 90% Chebyshev UPL used in 2009 BSR was appropriate for unknown probability distributions as found in the 2009 BSR dataset, but is not the best method for use in the Phase 1 DSR where background datasets exhibit normal or lognormal distributions. Shouldn't just use the same methods with out considering whether more appropriate methods could be applied.

| 02 | **Depth-Specific BCLs** |

D Bransford: Believes that breaking the background data into shallow and deep datasets is not appropriate for the OU-7 RI. Basis for using the entire soil column in BCLs is not just statistical. Wabuska Drain not only receives sediment from surficial run-on, but drain sidewalls are exposed over 0 to 4-6 ft bgs. Erosion of sidewalls adds sediment to the drain and therefore receives input from the entire soil column.

J Shireman: Didn't get this from the write-up, would consider this if the case is made and rationale is presented that this is a mechanism for deeper soil entering the drain.

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03   Phase 1 Soil Sampling Below 6 Feet

J Shireman: Asked if soil data from below 6 ft were compared to BCLs.

J Roseberry: Explained that these deeper borings were used to confirm the location of the Former Wubuska Drain alignment at and near borehole T5-0, and that the buried drain alignment was located by visual indicators, specifically the presence of charred vegetation at depts, corresponding to the anticipated depth of the former Wabuska Alignment. Concentrations of the COIs in samples >6ft were very low, nearing DLs for many metals.

J Shireman: Accepted use of the borings and visual confirmation of the location of the former drain alignment given the context and encouraged better explanation of deeper sample uses.

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04   Outlier Tests

J Shireman: Noted ternary plots, box-whisker plots, and elemental discrimination (scatter) plots are useful tools for identifying impacted background areas and should be included.

D Bransford: Proposed looking at box-whisker and scatter plots, but not ternary plots because characterization of soil compositional differences is not necessary for identification of outliers.

J Shireman: Ok with box-whisker and scatter plots, and do not need to go as far as use of ternary plots.

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05   Two Sample Tests

J Shireman: Explained rationale behind suggesting two-sample tests (t-test) as a tool for distinguishing different sample groups (or identifying similar groups). Noted that the OU-7 RI Work Plan stated this testing would be done, but it was not for the DSR. Suggested use of this tool for could be used to justifying pooling the data with in the sample depth groups Wabuska Drain if the 2-sample tests results indicated they were not statistically significantly different. Further agreed that focusing tests on COIs would be acceptable. The Phase 1 DSR did a good job at explaining COIs, but the correlation matrix for all analytes was unduly cumbersome, presenting correlations for so many pairs its utility was lost.. Box-whisker plots by depth in the Tech Memo do not show much difference for some COIs between depth intervals, and provide one line of evidence for pooling the data but felt 2-sample tests are needed to provide quantitative evidence.

D Bransford: Accepted rationale for testing, but stated it should only be done to compare the north and south datasets, and not for depth-specific datasets for the reasons noted earlier.

J Shireman: Accepted this proposal, as long as the basis for excluding depth-specific analyses is provided.

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06   BCL Statistic Selection

J Shireman: Discussed selection of BCL statistics and recommended allowing the data distribution to drive the selection of the statistic. The 90% Chebyshev was not applicable to most Phase 1 COIs because the data followed know distributions, normal, lognormal, or gamma distributions. Typically prefers a parametric 95% UTL for known distributions ot arrive at appropriate BCLs.

D Bransford: Agrees that 95% confidence interval be considered and proposed that new BCL calculations take the distribution into consideration.

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07   Outlier Treatment

J Roseberry: Raised a question about treatment of near outliers, as identified by ProUCL, noting that ProUCL outlier tests assume normal distribution that may not work well with lognormal or gamma distributions. Asked J Shireman his opinion about leaving potential outliers in a dataset.

J Shireman: Was not sure how ProUCL tests for outliers and makes assumptions for outliers. Stated outliers should not be removed just because they are outliers. This requires discussion/justification for keeping potential outliers. Agreed to follow up on this with J Roseberry with in the week.

08	Conclusions

D Bransford: Will propose to ARC that further background evaluation be done using: a) visualizations (box-whisker and scatter plots); b) hypothesis tests on populations, with justification for use of two background areas and full-depth BCLs; and c) use the data distribution to drive selection of the BCL statistic.

J Roseberry and J Shireman: Will to continue discussion on outliers and J Shireman will look into outlier treatment in ProUCL and follow up with J Roseberry.

09	Exit Strategy

D Bransford: Asked if ARC proceeds as outlined in Conclusions whether the methods would be acceptable so that the results will be approved.

J Shireman: Stated he could not speak for EPA, but this would be acceptable to APTIM.